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Evolution of broad-band SED during outburst rise in NS X-ray Nova Aql X-1

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Abstract

© 2017 The Author(s). The observed evolution of the broad-band spectral energy distribution (SED) in NS X-ray Nova Aql X-1 during the rise phase of a bright Fast-Rise-Exponential-Decay-type outburst in 2013 can be understood in the framework of thermal emission from non-stationary accretion disc with radial temperature distribution transforming from a single-temperature blackbody emitting ring into the multicolour irradiated accretion disc. SED evolution during the hard to soft X-ray state transition looks unusual, as it cannot be reproduced by the standard disc irradiation model with a single irradiation parameter for NUV, Optical and NIR spectral bands. NIR (NUV) band is correlated with soft (hard) X-ray flux changes during the state transition interval, respectively. In our interpretation, at the moment of X-ray state transition UV-emitting parts of the accretion disc are screened from direct X-ray illumination from the central source and are heated primarily by hard X-rays (E > 10 keV), scattered in the hot corona or wind possibly formed above the optically thick outer accretion flow; the outer edge of multicolour disc, which emits in Optical-NIR, can be heated primarily by direct X-ray illumination. We point out that future simultaneous multiwavelength observations of X-ray Nova systems during the fast X-ray state transition interval are of great importance, as it can serve as 'X-ray tomograph' to study physical conditions in outer regions of accretion flow. This can provide an effective tool to directly test the energy-dependent X-ray heating efficiency, vertical structure and accretion flow geometry in transient low-mass X-ray binaries.

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Keywords

Accretion, Accretion discs -methods: observational, Binaries: close, Stars: neutron, X-rays: binaries

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